22-330.fm Page 1 Friday, August 6, 1999 12:34 PM

Cat. No. 22-330

**OWNER'S MANUAL**

Please read before using this equipment.

# Electronic Components Tester

RadioShack®

# FEATURES

Your RadioShack Electronic Components Tester is a compact device that lets you quickly check many common types of electronic components:

- Bipolar transistors
- Darlington transistors
- FETs (field effect transistors)
- IGBTs (isolated-gate bipolar transistors)
- JFETs (junction field effect transistors)
- MOSFETs (metal oxide silicon field effect transistors)
- LEDs (light-emitting diodes)
- Power diodes
- Zener diodes
- SCRs (silicon controlled rectifiers)
- TRIACs (bi-directional rectifiers)

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22-330.fm Page 3 Friday, August 6, 1999 12:34 PM

**Important:**

- This tester is not designed for commercial, industrial, or outdoor use.
- The tester is not designed to replace devices such as transistor curve tracers or production test equipment.
- If you are not familiar with semiconductors and testing procedures, we suggest you read the books *Basic Semiconductor Circuits* (RadioShack Cat. No. 62-5013, not supplied) before you use this tester.

22-330.fm Page 4 Friday, August 6, 1999 12:34 PM

Your tester has these features:

**Auto On/Off** — automatically turns on at the touch of a button and off when you finish using it.

**Three Connection Options** — quickly connect components to the tester using its built-in test clips and sockets, or connect components with axial leads to the tester's component slots.

**Continuity Check** — lets you quickly hear and see if there is continuity between both ends of a cable.

Your tester requires three AAA batteries (not supplied).

22-330.fm Page 5 Friday, August 6, 1999 12:34 PM

**Notes:**

- Your tester checks junctions and continuity of connected components. Since not all components of the same type work the same way, the tester might not accurately test some listed types of components.
- If the tester shows that an expensive component is bad, have the component checked by a qualified electronics technician before disposing of it.
- Your tester is designed to test components out of circuit. You cannot use it to test components in circuit unless the component's leads are disconnected from the circuit and connected to the tester.

22-330.fm Page 6 Friday, August 6, 1999 12:34 PM

# CONTENTS

**Preparation ..... 7**
Installing/Testing Batteries ..... 7

**About Your Tester ..... 10**
Test Points ..... 10
Controls and Displays ..... 11

**Operation ..... 13**
Component/Testing Notes ..... 22
Continuity ..... 22
Diodes ..... 22
SCRs and TRIACs ..... 23
General Rules for Transistors ..... 24
JFETs ..... 26
MOSFETs ..... 26
IGBTs ..... 27

**Care ..... 28**

22-330.fm Page 7 Friday, August 6, 1999 12:34 PM

# PREPARATION

## INSTALLING/TESTING BATTERIES

Your tester requires three AAA batteries (not supplied) for power. For the best performance and longest life, we recommend alkaline batteries.

**Warnings:**

- To avoid electrical shock, disconnect the tester's test clips from any equipment before you install or remove the tester's batteries.
- Do not operate your tester until batteries are properly installed and the battery compartment cover is in place and secured.

22-330.fm Page 8 Friday, August 6, 1999 12:34 PM

**Cautions:**

- Use only fresh batteries of the required size and recommended type.
- Do not mix old and new batteries, different types of batteries (standard, alkaline, or rechargeable), or rechargeable batteries of different capacities.

Install three AAA alkaline batteries into the tester. If you do not plan to use the tester for a few weeks, remove the batteries.

**Cautions:**

- Always remove old or weak batteries. Batteries can leak chemicals that can destroy electronic parts.

22-330.fm Page 9 Friday, August 6, 1999 12:34 PM

- Dispose of old batteries promptly and properly. Do not burn or bury them.

To test the batteries, touch the black and red test clips together then press **CONT** •)) . ANODE/NPN and ANODE/PNP light and a tone sounds. If the tone does not sound, remove a battery, wait about 30 seconds, reinstall it, then press **CONT** •)) again. If no tone sounds, replace the batteries.

22-330.fm Page 10 Friday, August 6, 1999 12:34 PM

# ABOUT YOUR TESTER

The tester turns on when you press any of its buttons. When you release the button after testing a component, the tester turns off.

## TEST POINTS

**(ILLUS - SHOW FRONT OF TESTER. CALL OUT 'COMPONENT SLOTS' (UNDER ANODE/NPN AND ANODE/PNP), 'TEST SOCKETS' (UNDER TRANSISTORS), AND 'TEST CLIPS' (UNDER BLACK, YELLOW, AND RED)**

To test a component, connect it to one of the tester's test points.

22-330.fm Page 11 Friday, August 6, 1999 12:34 PM

**Component Slot** — lets you connect a component with 2 legs (an axial diode, for example). The tester's component slots are labeled – and +.

**Test Socket** — lets you connect a component with 3 legs. The test sockets are labeled **BASE3** (black), **BASE2** (yellow), and **BASE1** (red).

**Test Clip** — lets you connect a component with 2 or 3 legs or terminals. The test clip's insulators are colored black, yellow, and red.

## CONTROLS AND DISPLAYS

**TRANS** — press to check bipolar transistors, JFETs, MOSFETs, and IGBTs.

22-330.fm Page 12 Friday, August 6, 1999 12:34 PM

**DIODE** — press to check all types of diodes.

**SCR** — press to check SCRs and TRIACs.

**CONT** •)) — press to check for continuity.

**ANODE/NPN** — lights to show the anode of a diode or the junction type of a transistor.

**ANODE/PNP** — lights to show the cathode of a diode or the junction type of a transistor.

**BAD** — lights if the tester determines that a component is faulty.

**BASE3, BASE2, BASE1** — light to show specific information about the junction of a device connected to the test sockets or test clips.

22-330.fm Page 13 Friday, August 6, 1999 12:34 PM

# OPERATION

To test a device with three connectors, connect it to the **BASE3**, **BASE2**, and **BASE1** test sockets or to the black, yellow, and red test clips. To test a device with two connectors, connect it between the **–** and **+** component slots, **BASE3** and **BASE1** test sockets, or the black and red test clips. Then, depending on the type of device you are testing, press one of the following:

- **CONT** •)) to test continuity
- **DIODE** to test a diode. The tester shows you which lead is the anode and checks if the diode is conducting only in one direction.
- **SCR** to test an SCR or TRIAC. The tester shows the SCR's gate and anode, and identifies a TRIAC.

22-330.fm Page 14 Friday, August 6, 1999 12:34 PM

- **TRANS** to test a bipolar, JFET, MOSFET, or IGBT transistor. The tester shows the transistor's base and collector and tests if the transistor is working properly. (The remaining pin is the emitter).

This section shows what the tester displays when you test each type of component.

**Legend**

● - off

◯ - on

Ⓕ - flashing

**Note:** See "Component/Testing Notes" on Page 22 for additional information about each type of component you can test.

22-330.fm Page 15 Friday, August 6, 1999 12:34 PM

| Function/ device | LED | | | | | |
|---|---|---|---|---|---|---|
| | BASE3 | BASE2 | BASE1 | ANODE/NPN | ANODE/PNP | BAD |
| Continuity (open) | ● | ● | ● | ● | ● | ● |
| Continuity (shorted) (tester beeps) | ● | ● | ● | ○ | ○ | ● |
| Transistor, NPN, EBC | ● | ○ | Ⓕ | ○ | ● | ● |

22-330.fm Page 16 Friday, August 6, 1999 12:34 PM

| Function/ device | LED | | | | | |
|---|---|---|---|---|---|---|
| | BASE3 | BASE2 | BASE1 | ANODE/NPN | ANODE/PNP | BAD |
| Transistor, NPN, B??, open | ○ | Ⓕ | ● | ○ | ● | ○ |
| Transistor, NPN, ??B, shorted | Ⓕ | Ⓕ | ○ | Ⓕ | ● | ● |
| Transistor, PNP, ECB | ● | Ⓕ | ○ | ● | ○ | ● |

22-330.fm Page 17 Friday, August 6, 1999 12:34 PM

| Function/ device | LED | | | | | |
|---|---|---|---|---|---|---|
| | BASE3 | BASE2 | BASE1 | ANODE/NPN | ANODE/PNP | BAD |
| Transistor, PNP, ?B?, open | Ⓕ | ○ | Ⓕ | ● | ○ | ○ |
| JFET, NCHAN, ??G, shorted | Ⓕ | Ⓕ | ○ | Ⓕ | ● | ● |
| JFET, NCHAN, ?G?, open | Ⓕ | ○ | Ⓕ | ○ | ● | ○ |
| JFET, PCHAN, G??, shorted | ○ | Ⓕ | Ⓕ | ● | Ⓕ | ● |

22-330.fm Page 18 Friday, August 6, 1999 12:34 PM

| Function/ device | LED | | | | | |
|---|---|---|---|---|---|---|
| | BASE3 | BASE2 | BASE1 | ANODE/NPN | ANODE/PNP | BAD |
| MOSFET, NCHAN, DGS | Ⓕ | ○ | ● | Ⓕ | ● | ● |
| MOSFET, NCHAN, ??G, open | ● | ○ | ○ | Ⓕ | Ⓕ | ○ |
| MOSFET, NCHAN, G??, short | Ⓕ | Ⓕ | ● | Ⓕ | Ⓕ | ○ |

| Function/ device | LED | | | | | |
|---|---|---|---|---|---|---|
| | BASE3 | BASE2 | BASE1 | ANODE/NPN | ANODE/PNP | BAD |
| MOSFET, PCHAN, GDS | ○ | Ⓕ | ● | ● | Ⓕ | ● |
| IGBT, NCHAN, EGC | ● | ○ | Ⓕ | ○ | ● | ● |
| IGBT,???, ??? | ○ | ○ | ● | Ⓕ | Ⓕ | ○ |
| no transistor installed | ○ | ○ | ● | Ⓕ | Ⓕ | ○ |

22-330.fm Page 20 Friday, August 6, 1999 12:34 PM

| Function/ device | LED | | | | | |
|---|---|---|---|---|---|---|
| | BASE3 | BASE2 | BASE1 | ANODE/NPN | ANODE/PNP | BAD |
| Diode, CATH-ANODE | ● | ● | ● | ○ | ● | ● |
| Diode, ANODE-CATH | ● | ● | ● | ● | ○ | ● |
| Diode, open or none | ● | ● | ● | ● | ● | ○ |
| Diode, shorted | ● | ● | ● | ○ | ○ | ○ |

| Function/ device | LED | | | | | |
|---|---|---|---|---|---|---|
| | BASE3 | BASE2 | BASE1 | ANODE/NPN | ANODE/PNP | BAD |
| SCR, KGA, logic | Ⓕ | ○ | ● | ● | ● | ● |
| SCR, KGA, 1 amp | Ⓕ | ○ | ● | ● | ● | ○ |
| TRIAC, ??? | Ⓕ | Ⓕ | ● | ● | ● | ● |
| TRIAC, AAG | Ⓕ | ● | Ⓕ | ● | ● | ● |

22-330.fm Page 22 Friday, August 6, 1999 12:34 PM

# COMPONENT/TESTING NOTES

## Continuity

Because the tester checks for continuity in both directions, it will not respond as described if you connect a good diode.

A resistor that is less than about 7.1K ohms (± 20%) and most capacitors rated above .1µF (± 20%) will show continuity.

## Diodes

You cannot accurately test some high-voltage diodes or two LEDs that are connected in series by using the tester.

22-330.fm Page 23 Friday, August 6, 1999 12:34 PM

## SCRs and TRIACs

- The tester cannot test an SCR for a latch-up condition.
- The tester might indicate that some types of high-current or power SCRs are TRIACs, or that some bad TRIACs are good SCRs.
- To test an SCR or TRIAC as accurately as possible, test the device more than once, switching the leads you use to connect the device to the tester each time. The tester should not display the same LEDs each time.

22-330.fm Page 24 Friday, August 6, 1999 12:34 PM

## General Rules for Transistors

The tester determines the type of transistor you connected based on the following rules:

- If there is a common PN junction to two other leads, the tester tries to find out if the transistor is a bipolar or a JFET device.
- If the transistor has only one PN junction or a shorted PN junction, or if the transistor is a shorted-junction TRIAC, the tester tries to find out if the transistor is a MOSFET.
- If the transistor has no valid PN junction, the tester tries to find out if the transistor is an IGBT.

22-330.fm Page 25 Friday, August 6, 1999 12:34 PM

**Caution:** Some types of RF-type bipolar transistors might be damaged if they are connected incorrectly to the tester. To be safe, make sure you can identify the device's pins before you connect it to the tester.

- If the internal base-to-emitter resistance in the power transistor being tested is less than about 7.1 kilohms, the tester might not find the base and will instead show that the transistor is bad and shorted.
- The tester might not accurately check some types of very high-gain Darlington or JFET transistors.

22-330.fm Page 26 Friday, August 6, 1999 12:34 PM

## JFETs

- If BAD lights when you test a JFET, it is because the JFET failed the MOSFET or IGBT tests. The tester will not detect a JFET that is actually shorted.
- An open JFET will register as bad during the bipolar checks.
- A MOSFET with a protection diode might register as a bipolar transistor.

## MOSFETs

- Since some MOSFETs can conduct in both directions at very low currents and voltages, the tester might show that this type of MOSFET is bad and shorted.

22-330.fm Page 27 Friday, August 6, 1999 12:34 PM

- MOSFETs with large forward voltage protection diodes usually register as IGBTs.
- If a MOSFET has a protection diode with a forward voltage that exceeds the tester's test voltages, the tester might show that the MOSFET is bad.

## IGBTs

The tester might incorrectly identify the collector and emitter of an IGBT. If the tester is successful in identifying the correct pin configuration, it will show the pinout as it would for a MOSFET. If no pinout is detected, the IGBT registers as a bad MOSFET.

**Note:** The tester cannot distinguish MOSFETs from IGBTs with built-in protection diodes.

22-330.fm Page 28 Friday, August 6, 1999 12:34 PM

# CARE

To enjoy your tester for a long time:

- Keep the tester dry. If it gets wet, wipe it dry immediately.
- Use and store the tester only in normal temperature environments.
- Handle the tester carefully. Don't drop it.
- Keep the tester away from dust and dirt.
- Wipe the tester with a damp cloth occasionally to keep it looking new.

Modifying or tampering with the tester's internal components can cause a malfunction and invalidate its warranty. If your tester is not performing as it should, take it to your local RadioShack store for assistance.

22-330.fm Page 29 Friday, August 6, 1999 12:34 PM

# SPECIFICATIONS

| | Max. | Min. | Typical | Units |
|---|---|---|---|---|
| Test Voltage | 5.25 | 3.00 | 4.50 | Volts |
| PN Conducting Limit | 2.63 | 1.50 | 21.25 | Volts |
| PN Not Conducting Limit | 2.64 | 1.51 | 2.26 | Volts |
| PN Current (shorted) | 525 | 300.00 | 450.00 | µAmps |
| PN Current (open) | 0.00 | 0.00 | 0.00 | µAmps |
| Shorted Voltage (any pin) | 0.70 | 0.60 | 0.64 | Volts |
| Beta Voltage | 5.25 | 3.00 | 4.50 | Volts |
| Beta Current | 52.50 | 30.00 | 45.00 | µAmps |
| Transistor On Limit | 2.63 | 1.50 | 2.25 | Volts |
| Transistor Off Limit | 2.64 | 1.51 | 2.26 | Volts |

22-330.fm Page 30 Friday, August 6, 1999 12:34 PM

Buzzer Frequency ..... 2.04 kHz

Buzzer Volume ..... 85 dBA

PN Test Time ..... 10 mSec

Display Time ..... 1 Sec
All voltages and currents are ± 20%

Specifications are typical; individual units might vary. Specifications are subject to change and improvement without notice.

22-330.fm Page 31 Friday, August 6, 1999 12:34 PM

22-330.fm Page 32 Friday, August 6, 1999 12:34 PM

*(Continued)*

In the event of a product defect during the warranty period, take the product and the RadioShack sales receipt as proof of purchase date to any RadioShack store. RadioShack will, at its option, unless otherwise provided by law: (a) correct the defect by product repair without charge for parts and labor; (b) replace the product with one of the same or similar design; or (c) refund the purchase price. All replaced parts and products, and products on which a refund is made, become the property of RadioShack. New or reconditioned parts and products may be used in the performance of warranty service. Repaired or replaced parts and products are warranted for the remainder of the original warranty period. You will be charged for repair or replacement of the product made after the expiration of the warranty period.

This warranty does not cover: (a) damage or failure caused by or attributable to acts of God, abuse, accident, misuse, improper or abnormal usage, failure to follow instructions, improper installation or maintenance, alteration, lightning or other incidence of excess voltage or current; (b) any repairs other than those provided by a RadioShack Authorized Service Facility; (c) consumables such as fuses or batteries; (d) cosmetic damage; (e) transportation, shipping or insurance costs; or (f) costs of product removal, installation, set-up service adjustment or reinstallation.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

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